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RESEARCH ARTICLE

Measuring Social Determinant Access and Equity by Race in U.S. States

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ABSTRACT

The effective design, implementation, monitoring, and evaluation of state programs to reduce racial health inequities requires measures of societal resource access (e.g., education, home ownership, voting) and access inequity by race in each state. This paper proposes criteria for the selection of social determinants to assess, and ways to combine data to assess overall access and overall access inequity in states. Access and equity can be compared across geographic regions assessed. Hypotheses regarding the determinants and consequences of access and equity can be examined. Means of validating metrics are proposed. An example of analysis of access and inequity for Blacks and Whites in U.S. states yields surprising results—social determinant access and access equity are generally greatest in southern states. These metrics can be used to target and measure the effects of interventions to advance health equity for racial minority populations. The condition of state access and equity by race indicates the culmination of structural racism.

Keywords: Measuring equity, social determinants of health, Black-White equity, U.S. state equity

1. Introduction:

Racial equity is justly a dominant global goal.^{1,2} The access by long-deprived minority racial populations to the elements of equity—education, housing, employment, law and justice, civic participation—are in part determined by federal and state laws, policies, and programs. Thus, it is reasonable and useful to examine the distribution among states of access to these elements of equity, i.e., “social determinants,” among racial populations.³ We can also monitor trends in racial equity in access to social determinants. And we can examine hypotheses regarding the determinants and consequences of access and equity. This paper proposes criteria for the selection of social determinants to measure in order to design and target equity interventions and monitor their effects. The approach is illustrated with the example of Black and White access and Black-White inequity in access to determinants in U.S. states. Data on Black and White access are from public sources and are collected periodically, allowing the monitoring of change. The findings of state access and equity by race indicate the culmination of structural racism.

Krieger characterizes health equity* as “...an absence of unjust health disparities between social groups, within and between countries. Promoting equity and diminishing inequity requires not only a “process of continual equalization” but also a “process of abolishing or diminishing privileges.”⁴ Krieger and others^{5,6} have noted that inequities arise from injustices associated with structural racism and other systemic forms of discrimination, and that redress of

*The terms “disparities” and “equality” are sometimes used interchangeably with inequity/equity. Here we distinguish the three terms. *Disparities* are simply differences, regardless of whether better or worse outcomes are associated with minority status, and regardless of the cause of the difference. *Equality* refers to equivalence in health outcomes and/or resources for health without regard to need or to the history of inequity associated with differences in outcomes. *Equity* connotes injustice associated with structural racism, such as school segregation and the exclusion from social benefits, e.g., housing and early versions of social security.

inequities require addressing equity not only in health care, but in all the social determinants of health, e.g., education, housing, justice, and civic participation. To systematically advance equity, equity and its components must be measured, examined, and monitored.

2. Materials and Methods:

This analysis develops a methodology for the assessment of Black-White equity in U.S. states by measuring Black and White access to a small and deliberately heterogeneous set of societal resources, and then comparing Black and White access in each state. The resources referred to are “social determinants of health,” in that they are known causes of longterm health. Access refers to the achievement (or lack of achievement) of a desirable societal good, such as education or housing. Equity refers to the similarity (or lack of similarity) between the access achieved by Blacks and Whites for each resource in each state.

The social divisions of the population examined here are Blacks and Whites in states. To the extent that the similar data are available for other racial populations (or by gender or age) and other geo-political entities (or nations), similar analyses will be possible.

2.1 Criteria for the selection of access components of equity:

- (1) the component must be a social determinant of health
- (2) the component cannot be an alternate measure of another included component
- (3) the set of components should represent a diverse and wide range of dimensions of social determinants.
- (4) the determinants must be mutable and “achievable,” so that interventions addressing them have the potential of modification to increase access and equity.
- (5) data on the component must be available at the state level and stratified by Black-White race.
- (6) optimally the data will be repeatedly collected over time to allow the assessment of trends in access and equity.

2.2 Indices selected to be conceptually independent and represent a broad array of dimensions:

There are multiple major social determinants of health, and it is useful to cover diverse dimensions of equity and to cover them without conceptual redundancy, i.e., measuring one dimension in several ways. Conceptual redundancy is largely a matter of judgment, as is heterogeneity of dimensions. Based on the criteria above we have chosen to examine the following dimensions: education, housing, employment, poverty, justice, and civic participation.^{7,8} While these dimensions were considered conceptually distinct, they are likely to be causally connected. The independence of selected determinants can be assessed by means of a correlation matrix; however, the presence of correlation does not allow distinction of conceptual overlap and causal connection. Intercorrelations should be expected since determinants are known to affect one another, e.g., employment and poverty, poverty and housing. Determinants are oriented in a common, i.e., negative, direction so that they can be combined mathematically, e.g., incarceration and voter non-registration (rather than voter non-registration).

2.3 Two indices developed:

We develop two indices, using state data—one of determinant access for Blacks and Whites, and one of Black-White equity in access. To assess access, rates of each determinant for Blacks and Whites were assessed for each state. To assess access for Blacks, access to each determinant was ranked for Blacks in each state. Ranking standardizes metrics across determinants and allows addition and comparisons across states. The index of overall access for Blacks, and sums the ranks across determinants for each state. If, for example, Iowa ranks 5th in Black high school non-graduation and 43rd in Black incarceration, and so on, these ranks of each determinant for Iowa are added to determine how Iowa ranks in overall determinant access for Blacks. The sums of ranks for each state are then reranked from 1 to 51.

Equity in determinant access is measured by taking the difference between Blacks and Whites for each determinant for each state. If the difference for a given determinant is zero, this indicates equity for this determinant. The larger the difference, the greater the inequity. Black-White differences for each determinant are ranked and ranked determinants are added for each state, thus indicating those states with more and less equity overall, for all determinants combined. The two indices developed here are conceptually

independent; greater Black access and low or high inequity are possible as are low Black access and low or high inequity.

2.4 Missing data: Most likely because of small numbers of Blacks in some states, e.g., Idaho, South Dakota, and Vermont, rates of Black access are missing for some determinants in some states. In order to assure that each determinant has an equal number of ranks that can then be added across determinants for each state, we have assigned the mean value of each determinant to each state with a missing value for that determinant.

2.5 The Index of Access can be modified: Determinants included in the index developed here can be dropped and other determinants can be added, assuming they meet the determined criteria. Access indices can also be differentially weighted, e.g., one half as important as another, or twice as important. For example, in this paper, we could have added lack of health insurance for those <65 years of age to the social determinants analyzed in an earlier study--high school non-completion, incarceration, non-home ownership, poverty, unemployment, and voter non-registration.⁹

2.6 Indices can be validated in two ways: They can be assessed in terms of expected, downstream outcomes. For example, access to social determinants is expected to be associated with health outcomes. Access equity may also be expected to be associated with health outcomes. These metrics in states can be compared with state health conditions, e.g., self-rated health or mortality among Blacks—such data are available at the state level.

The indices can also be validated by comparison with contextual conditions. For example, we might hypothesize that in states with greater proportions of Blacks, there would be higher proportions of Black legislators, thus presumably more power to assure greater access to determinants for Blacks and to assure Black-White equity. This is an empirical, testable hypothesis.⁹

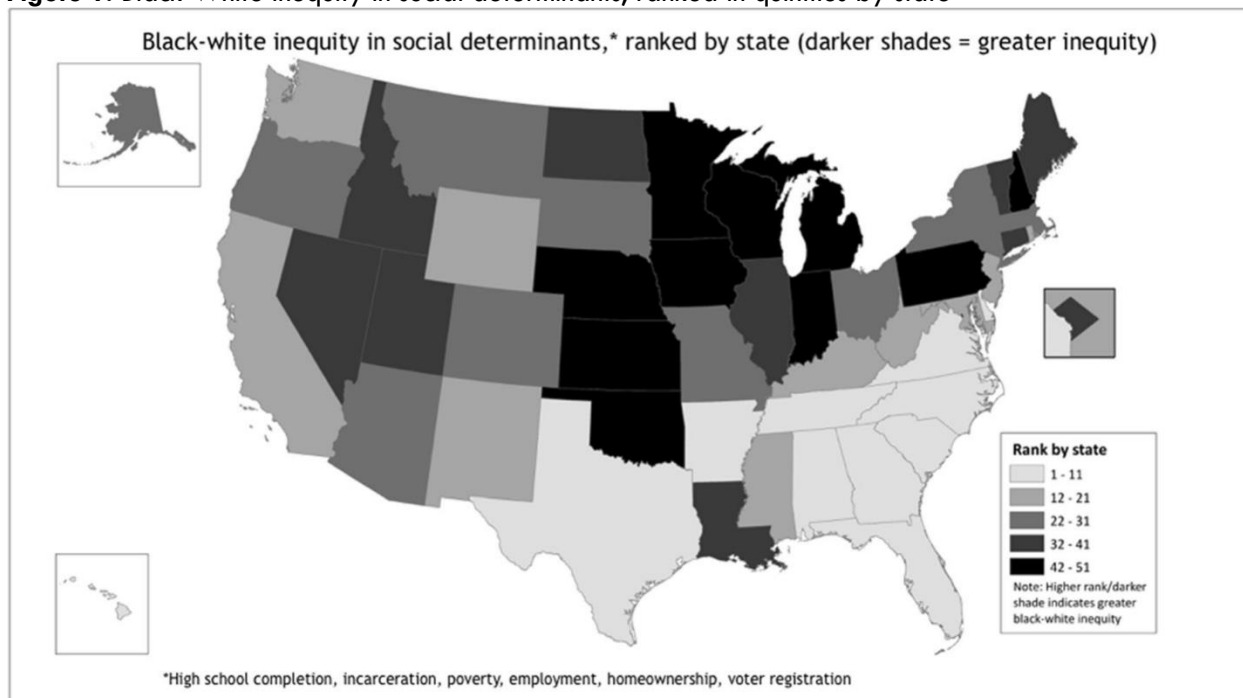
A contrary hypothesis is also plausible. Krieger et al. (2013) classify all states prior to the Civil Rights Act (1964) as “Jim Crow polities” or not, based on whether state laws legalized racial discrimination in one or more of several domains, including education, transportation, hospital and penal institutions, and employment.¹⁰ This

classification avoids the assumption that only Southern states had segregationist policies and adds Kansas and Wyoming as Jim Crow states. We could use classifications such as this to test the hypothesis that Jim Crow polities are likely to show lower access and lower Black-White equity compared with non Jim-Crow-polities—again an empirical question. (This hypothesis may not contradict the above hypothesis of population concentration because Krieger’s metric is based on

conditions approximately 45 years prior to the data used in the present analysis, and Black access and equity may have improved.)

2.7. Mapping: Overall state rankings for both indices can be divided into quintiles and mapped by state; arbitrarily, the lowest quintile includes 11 states/Washington, D.C., each remaining quintile contains 10 states/Washington, D.C. (Figure 1)

Figure 1: Black-White inequity in social determinants, ranked in quintiles by state



3. Results:

Black determinant access and Black-White access inequity in U.S. states

Data for the social determinants for Blacks and Whites in the U.S. are available in a prior publication.⁹ Rankings for each state on each determinant are displayed. Ranks on access are summed across determinants for each state. Inequity ranks are summed for each state, indicating

overall determinant inequity for the state for the chosen determinants (See the Black-White Access Equity Map by inequity quintiles).⁹ The measures of Black social determinant access and Black-White access inequity in U.S. states is given some validation by correlation with self-reported Black health in states, but not with a more distal outcome, Black mortality (Table 1).

Table 1 Associations between state characteristics and indices of determinant access and access inequity

Characteristic in state	Association with index of limited determinant access (LASDI)	Association with index of determinant access inequity (SDII)
Percentage black population in state	Beta = -0.54, $r^2 = 0.16$	Beta = -0.47, $r^2 = 0.12$
SDI	na	Beta = 0.76, $r^2 = 0.57$
Self-assessed poor/fair health	Beta = 196, $r^2 = 0.19$	Beta = 142, $r^2 = 0.10$
Mortality	Beta = 0.0025, $r^2 = 0.0009$	Beta = 0.002, $r^2 = 0.0004$

4.0 Discussion:

We are not aware of previous efforts to develop such indices. The excellent America's Health Rankings project (<https://www.americashealthrankings.org/>) reviews a range of social determinants and health outcomes in geographic regions in the U.S., but does not use an overall equity measure.

The redress of inequities in the U.S. requires the design, evaluation, and monitoring of social determinants in states. While the whole U.S. population is subject to federal law and policy, states may enforce federal laws and implement programs and policies in different ways. In addition, each state has its own laws, policies, and programs, commonly determined by elected officials and, in turn, affecting the welfare and distribution of resources for its population. Thus, for several reasons, the states are critical units in which to assess the distribution and differential population distribution of societal resources. As seen in the present analysis, results of such analyses may run contrary to common expectation, namely that equity is least in southern states—historically slave states and supporters of segregated institutions. We find both access and equity generally greatest in southern states and least in north central states.⁹

Indices may be inherently imperfect. They combine characteristics of differing dimensions and metrics. Determinant counts do not generally indicate the quality of what is counted. For

example, that one state has a lower high school graduation rate than another gives no indication of the quality of education achieved in the one state versus the other. Rates of homeownership do not indicate the quality of the housing or its location. It is plausible that simple counts underestimate the gap between the social determinant access of Blacks and Whites. Poverty may have different consequences in a state with high versus lower costs of living, a state with or without state income taxes, a state with more or fewer low-income assistance sources, e.g., Medicaid Expansion. Thus, determinant counts are imprecise indicators. Ranks compound this imprecision, and rank summaries combine data over diverse units. The creation of indices and the ranking of measures is undertaken on the assumption that the benefits of summary across dimensions outweigh the loss of precision. The association of indices with other demographic and health characteristics of interest lends support to their conceptual validity.

5.0 Conclusion:

Indices of access to social determinants by race and determinant access differences, i.e., inequity, by race can be important tools in the promotion of access and the correction of inequities. By providing comparable metrics, they allow the targeting and design of interventions as well as their evaluation.

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